Improving production from arid rangelands of the south-western United States

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Summary

Three methods of several possibilities are discussed for improving production from arid rangelands. Sandy lands infested with mesquite can be improved by aerially spraying with 2,4,5-T. Natural recovery of perennial grasses, primarily mesa dropseed, following spraying resulted in 204 kg/ha herbage compared to 33 kg/ha on the adjacent unsprayed area.

An area infested with creosotebush was root-plowed and seeded. Herbage production in 1975 was 1,631 kg/ha, primarily Lehmann and Boer lovegrass.

Cattle production was increased by crossbreeding Herefords with either Brangus or Santa Gertrudis. The weaning weights of Santa Gertrudis calves were heavier than calves from the other two breeds, but the conception rate was higher for the Brangus cows. Calf production per cow was about 50% greater from the crossbred dams than from the Hereford dams.

The productivity of range forage on arid rangelands in the south-western United States has been greatly reduced during the past century by a rapid increase of noxious shrubs [1]. An increase of brush is responsible for the loss of forage resources that formerly contributed significantly to the production of livestock and wildlife. As undesirable shrubs increase, there is a corresponding loss of protective forage species and an increase in wind and water erosion. Furthermore, calf crop and weaning weight are sometimes low, particularly during and after droughty periods. In recent years, research has been aimed not only at ways of recovering lost forage production, but also at ways of improving returns from cattle used to harvest the forage.

In this paper we will discuss methods for improving rangelands invaded by two shrubs, and the performance of three breeds of livestock and their crossbred offspring. The Jornada Experimental Range is in southern New Mexico, where the average annual precipitation is 225 mm. The precipitation is highly variable with respect to time and place. Plants grow in brief periods after effective rainfall that usually occurs from July through September.

Reclaiming mesquite sand dunes

Only 4.8% of the plains on the Jornada Experimental Range was dominated by honey mesquite (*Prosopis glandulosa* Torr.) in 1858 [2]. By 1963, 50.3% of the area was dominated by mesquite. The rapid increase in honey mesquite in recent years is a result of dispersal of mesquite seed by livestock. Mesquite is a strong competitor for the meager soil water. Bare areas around mesquite increase as the plants mature. On sandy soils, the unprotected soil is deposited around the mesquite plants and eventually forms sand dunes.

Aerial spraying of mesquite resulted in plant kills of 8—57% during 11 years [3]. Control was best in years with available soil water before and at the time of spraying, and when

Table 1. Perennial grass yields on areas sprayed twice for mesquite control and on adjacent unsprayed areas, and the July—September precipitation

Year	Sprayed area	Unsprayed area	July—September precipitation
	kg/ha	kg/ha	mm
1963	92	35	170
1964	383	52	140
1965	48	13	94
1966	277	19	125
1967	335	11	146
1968	269	104	153
1969	234	39	130
1970	333	59	130
1971	104	22	93
1972	225	8	138
1973	133	45	99
1974	135	12	282
1975	87	9	168
Average	204	33	144

the plants were fully leafed and growing vigorously. Control was poor in years with little or no available soil water during the winter-spring prior to spraying. The standard treatment for aerially spraying mesquite has been 0.6 kg 2,4,5-T ((2,4,5-trichlorophenoxy)acetic acid) per ha in a 1:7 diesel oil to water emulsion at a total volume of 50 liters per ha.

An area aerially sprayed twice for mesquite control during 1958—61 had an annual average yield of 204 kg/ha of air-dry perennial grass herbage for 1963—75 compared to 33 kg/ha on an adjacent unsprayed area (Table 1). The major perennial grass species was mesa dropseed (*Sporobolus flexuosus* (Thurb.) Rydb.). Mesa dropseed is a short-lived perennial that requires periodic seedling establishment to maintain a good stand. Therefore, the yield shown in Table 1 varies with both the precipitation and the stand. The sand dunes on the sprayed area have levelled appreciably, and wind erosion has been markedly reduced.

Reclaiming creosotebush ranges

Creosotebush (*Larrea tridentata* (DC.) Coville) dominated 0.4% of the plains of the Jornada Experimental Range in 1858 and 14.2% in 1963 [2]. It was initially confined to dry, rocky ridges. As mesquite and tarbush (*Flourensia cernua* DC.) began to dominate the slopes adjacent to mountains, the original grass stands were thinned. Eventually, creosotebush moved onto those sites and displaced the mesquite, tarbush, and remaining grass stands.

There are virtually no residual grass stands on sites dominated by creosotebush, nor is there any substantial natural revegetation following control of the shrub. Therefore, equipment was developed for seeding rangeland infested with brush [4]. This equipment is towed by a track-type tractor with a root plow. The root plow kills the brush. The equipment consists of a brush conveyor, basin-forming blade, and a seeder. A hydraulically operated blade between the root plow and seeder forms basin pits. The seedbed left by the root plow is loose and fluffy, so a seeder with individually suspended press wheels firms the soil. The seed is dropped into a V-shaped groove pressed into the soil and is covered with soil by drag chains. The brush conveyor picks up the brush from behind the root plow and windrows it over the seeded area. Thus water is concentrated and shade is provided for part of the seeded area.

Numerous species were seeded at several

sites across southern New Mexico with the equipment just described [5]. The species most easily established on the loamy sites infested with creosotebush were: Lehmann lovegrass (*Eragrostis lehmanniana* Nees), Boer lovegrass (*E. chloromelas* Steud.), black grama (*Bouteloua eriopoda* (Torr.) Torr.), sideoats grama (*B. curtipendula* (Michx.) Torr.), blue panicgrass (*Panicum antidotale* Retz.), yellow bluestem (*Bothriochloa ischaemum* (L.) Keng), and fourwing saltbush (*Atriplex canescens* (Pursh) Nutt.). Various combinations of these species and some of their adapted varieties were seeded July 1972 with the equipment described above. Above-average precipitation during August—October 1972 resulted in good seedling emergence on this plot of about 6 ha. After 3 years of relatively favorable precipitation, 1,631 kg/ha of forage was produced compared to virtually none on adjacent untreated areas. About 56% of this total production consisted of Lehmann lovegrass. The highest-yielding variety of Lehmann lovegrass was 'NM-317'. About 33% of the total production was Boer lovegrass; the highest-yielding variety was 'Catalina'. The remainder of the production was contributed by black and sideoats grama, blue panicgrass, and yellow bluestem. There were also scattered plants of fourwing saltbush.

Increasing production of cattle

The dominant breed of cattle in the southwestern United States is Hereford. In 1967, we began studying production of Hereford, Brangus, and Santa Gertrudis cattle, and their F_1 crosses. Our objective was to determine if we could increase production above that obtained from straight Herefords. The cattle were on arid rangeland yearlong. The cows were given a nominal amount of supplemental feed during springs that were droughty. A mixture of salt and phosphorus was available to the cattle yearlong. Purebred bulls of the three breeds were with the cows from June 1 to October 1. The cows had their first calves when they were 3 years old. Calves were weaned and the cows were tested for pregnancy

Table 2. Cattle production on the Jornada Experimental Range, annual average for 1971—1975

Breed[1]	Cow	Calf		Cow	
		Weaning weight	Age at weaning	Pregnancy	Production
Sire × Dam	No.	kg	Days	%	kg
H × H	110	124	169		
B × H	51	143	182		
SG × H	45	144	160		
[2] × H	206	132	170	70	92
B × B	20	146	148		
H × B	10	133	132		
[2] × B	33[3]	144	143	82	118
SG × SG	21	175	164		
H × SG	17	165	150		
B × SG	9	171	159		
[2] × SG	47	170	158	70	119
[2] × H–SG	54	170	180	81	138
[2] × H–B	30	165	177	88	145
[2] × B–SG	11	167	178	86	144

[1] H = Hereford; B = Brangus; SG = Santa Gertrudis
[2] Average all cows of that breed regardless of sire
[3] The total includes three SG × B

about November 1. Table 2 shows the average annual weaning weight of the calves, the age of calf at weaning, percentage of cows pregnant, and the calf production per cow for the period 1971—1975. In some cases, there was more than one breed of sire with the cows, so pregnancy is reported only by breed of dam.

From the study we may conclude:

(1) The weaning weight of calves from Hereford cows was improved by using Brangus or Santa Gertrudis bulls;

(2) The weaning weight of calves from Santa Gertrudis cows or crossbred cows was higher than that of those calves born to Hereford or Brangus cows;

(3) The Brangus and crossbred cows had a higher conception rate than did the Hereford or Santa Gertrudis cows;

(4) The crossbred cows with Brangus breeding had a higher conception rate than did cows without Brangus breeding;

(5) Calf production per cow was higher from Brangus or Santa Gertrudis cows than that from Hereford cows;

(6) The crossbred cows had a higher calf production per cow than did the three straightbred cows.

The conception rate of Hereford cows was reduced more during drought years than any of the other breeds. The calf age at weaning was consistently greater for the crossbreds than for the straightbreds. Of the straightbreds, the Herefords had calves earlier in the year than the other two breeds, indicating that they bred back sooner than the other two breeds.

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